Self-Reported Fever and Measured Temperature in Emergency Department Records Used for Syndromic Surveillance

Self-reported fever and measured temperature in emergency department records used for syndromic surveillance

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ABSTRACT

Many public health agencies monitor population health using syndromic surveillance, generally employing information from emergency department (ED) visit records. When combined with other information, objective evidence of fever may enhance the accuracy with which surveillance systems detect syndromes of interest, such as influenza-like illness. This study found that patient chief complaint of self-reported fever was more readily available in ED records than measured temperature and that the majority of patients with an elevated temperature recorded also self-reported fever. Due to its currently limited availability, we conclude that measured temperature is likely to add little value to self-reported fever in syndromic surveillance for febrile illness using ED records.

INTRODUCTION

Public health agencies conduct surveillance to monitor and detect health events within populations and to measure the impact of public health interventions. Emergency department (ED) visit records are a frequently used source of information for syndromic surveillance.[1–3] Syndromic surveillance data, which are usually available before a diagnosis is made, can be analyzed to detect and characterize unusual healthcare utilization patterns, which may trigger further public health investigation and intervention. Because syndromes are non-specific and there is a behavioral component to healthcare utilization, objective signs of illness, such as measured temperature (T) may enhance the accuracy of case detection in these systems[4] and ultimately the accuracy with which outbreaks are detected and described. According to the experience of the authors working with ED syndromic surveillance data collected through the BioSense and Distribute systems, however, measured temperature is not captured consistently in ED triage data, so we sought to examine the frequency with which measured temperature is recorded and the judgment between measured temperature (T) and self-reported fever (F) in the chief complaint field of the ED triage record.

METHODS

ED triage records dated between January 1, 2011 and October 18, 2011 were retrieved from BioSense, a national automated surveillance system including near real-time reports, from 665 hospitals in the USA. Records included data on age, race, ethnicity, disposition (admitted or discharged), chief complaint, and measured temperature. For each record, we first determined whether a measured temperature was recorded. If there was a measured temperature, we determined if fever was reported in the chief complaint and whether the measured temperature indicated the presence of fever (>38.0°C). We estimated the confidence interval around the proportion of records containing a measured temperature using the binomial method. Cohen's κ coefficient was calculated to measure the agreement between measured temperature and presence of fever in the chief complaint field.

RESULTS

A total of 16 571 619 ED visits were captured by the BioSense system during the study interval. A measured temperature was recorded for 2 151 198 (12.98%; 95% CI 12.96% to 13%) of these visits, while a chief complaint was recorded for all visits. In total, 1 024 249 (6.18%) visits had a chief complaint of self-reported fever, while 98 625 (0.595%) visits had a measured temperature that indicated fever. Considering only the 2 158 198 ED visits with a measured temperature recorded, table 1 shows the relationship between measured temperature (T) and self-reported fever (F) in the chief complaint field. Fever by measured temperature was found in 98 625 patients (4.57%), while fever by self-report was observed in 159 697 patients (7.40%). Although there was moderate[5] agreement between measured and self-reported temperature ($\kappa=0.423$, 95% CI 0.420 to 0.425, $p<0.001$ for $\kappa=0$), the majority of the 98 625 records with fever by measured temperature also had self-reported fever (58 997/98 625, 59.82%). In contrast, a minority of the 159 697 patients with self-reported fever had fever by measured temperature (58 997/159 697, 36.94%).

DISCUSSION

Fever is an important component of the case definition for many conditions monitored through syndromic surveillance, including influenza-like illness. Case-detection algorithms can identify fever in ED records through the patient chief complaint or measured temperature. We found that measured temperature was available infrequently in the ED records we examined. Although we could not assess the accuracy of either approach in this study, when measured temperature was present and elevated,

Table 1 Emergency department visits comparing measured temperature to self-reported fever

	Measured temperature (T)		
Self-reported fever (F)	**>38°C N (%)**	**≤38°C N (%)**	**Total N (%)**
Yes	58 997 (2.73)	100 700 (4.67)	159 697 (7.40)
No	39 628 (1.84)	1 958 873 (90.76)	1 998 501 (92.60)
Total	98 625 (4.57)	2 059 573 (95.43)	2 158 198 (100.00)

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self-reported fever tended to be recorded in the chief complaint. However, when a patient reported fever, the measured temperature was often normal.

The low frequency with which measured temperature is captured in ED records limits the usefulness of this data element for syndromic surveillance as exclusion of many records missing a recorded temperature may bias or limit the accuracy of a surveillance system. When measured temperature is captured, the tendency for it to be normal in the presence of self-reported fever is not surprising because febrile patients are likely to take over-the-counter antipyretic medicine such as acetaminophen or ibuprofen before visiting an ED, masking what would otherwise be a febrile measured temperature at the time of the visit.

If measured temperature was recorded more consistently, it could add information to help identify severe or acute disease and may add to the sensitivity of syndromic surveillance in identifying patients with fever. For example, in our data, a case definition of febrile illness that included patient self-report of fever or measured temperature would classify 9.2% of visits as febrile illness as compared to 7.3% of ED visits for self-reported fever alone.

The potential contribution of measured temperature to ED-based syndromic surveillance practice should be assessed further using methods such as chart review and evaluation of surveillance time-series aggregated from records with measured fever. Also, as measured temperature is captured more frequently in triage systems, the utility of this data element may increase. The BioSense program is looking for other examples of how to quickly move science into practice by further collaborating with members of the scientific, clinical, and public health communities.[6]

Contributors TAK conceived and supervised the study and conducted the analysis, DB conducted the analysis and revised the manuscript, JB provided insights into the study design, ZX and PM assisted with the data management and statistical analyses, CKTI provided insights into the study design, JG provided insights into the study, and BLM contributed to the study design. All authors revised the manuscript for important intellectual content and approved the version submitted for review.

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